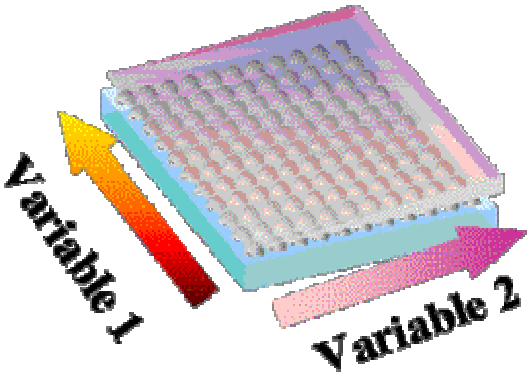
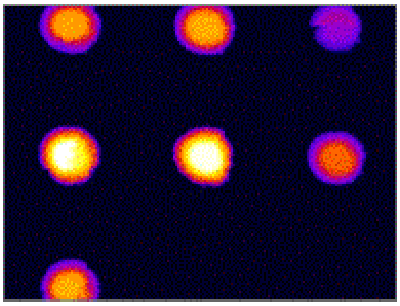
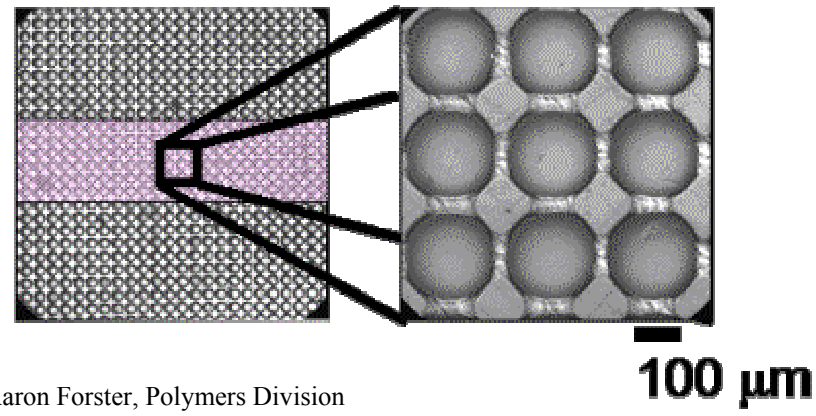
Quantitative Polymer Adhesion Measurements

- Critical Issues
  - The challenge is to understand the fundamental driving forces for the development of adhesive strength at polymer/polymer, polymer/metal, polymer/ceramic, and polymer/biomaterial interfaces in multivariable environments.
- Research Strategy
  - The goal is to develop a methodology for quantitatively measuring the adhesive strength of polymer interfaces in a combinatorial manner. The combinatorial libraries consist of two components: 1) an array of microlenses with a well-defined geometry and 2) a flat substrate. The processing of these libraries will dictate a unique combination of adhesion-controlling variables at each microlens contact point. By monitoring the contact area and relative displacement of each microlens during contact and separation from the flat substrate, the adhesion energy can be mapped across the multivariable library.
- Research Highlights
  - Current research efforts have focused on the design and preparation of the microlens combinatorial libraries, the instrumentation for controlling contact and separation, and the development of software to automate the data collection and analysis. Initial tests investigating the self-adhesion of polystyrene validate the technique and demonstrate a thickness and temperature dependence for the adhesion of glassy polymer coatings. Current libraries yield the data equivalent of 1600 adhesion tests within the same time required for a single conventional adhesion test.







For more information ...

Christopher Stafford, Aaron Forster, Polymers Division